hemisphere shall have been examined, when a division of the sky into small sections of approximately equal area will make it possible to decide whether there is any marked tendency toward gregariousness on the part of the double stars and also whether, as a whole, they are distributed symmetrically relatively to some plane,—as, for instance, that of the Milky Way.

LICK OBSERVATORY, December 4, 1906.

ASTRONOMICAL OBSERVATIONS IN 1906.

MADE BY TORVALD KÖHL, AT ODDER, DENMARK.

VARIABLE STARS.

Z Cygni.[1]

Jan.	20:	Z = c.	Aug.	31:	$\begin{cases} < \text{b}' \\ > \text{b} \end{cases}$
Apr.	8:	invisible.	Sept.	8:	= b.
	14:	< e.		19:	id.
	22:	id.		24:	id.
May	24:	id.	Nov.	10:	1 step > e.
July	26:	= b.		13:	1 step < e.
Aug.	19:	$\begin{cases} < \text{a} \\ > \text{b}' \end{cases}$	Dec.	4:	3 steps < e.
	24:	= b′.		9:	id.
	27:	id.		23:	invisible.

S Ursæ Majoris.[2]

Jan.	1:	S = g.	May	23:	= e.
	19:	f′.	July	26:	invisible.
Feb.	28:	1 step < e.	Aug.	19:	= g.
Mar.	14:	= d.		24:	$\begin{cases} > \text{g} \\ < \text{f} \end{cases}$
	19:	id.	Aug.	27:	id.
	29:	2 steps > d.		31:	id.
Apr.	2:	id.	Sept.	5:	1 step > f′.
	5:	$\begin{cases} 4 \text{ steps} > \text{d} \\ 9 \text{ steps} < \text{c} \end{cases}$		8:	$\begin{cases} < \text{e} \\ > \text{f}' \end{cases}$
	8:	6 steps > d.		10:	id.
	10:	id.		12:	id.
	12:	id.		19:	id.
	14:	4 steps < c.		21:	1 step < e.
	22:	id.		23:	id.
May	11:	= d.			

[1] Vide the sketch in the *Publications A. S. P.*, No. 100, p. 16.
[2] Vide the sketch in the *Publications A. S. P.*, No. 73, p. 56.

Sept. 24:	id.	Dec. 4:	1 step > d.
27:	= e.	9:	3 steps > d.
Oct. 11:	= d.	23:	= e.
Nov. 10:	4 steps > d.		
13:	id.		

T *Ursæ Majoris.*[1]

Jan. 1:	T = d.	Aug. 31:	id.
19:	1 step > e.	Sept. 5:	= b.
Feb. 28:	invisible.	8:	id.
Mar. 14:	id.	10:	id.
19:	id.	12:	id.
29:	id.	19:	< b. or > c.
Apr. 5:	id.	21:	1 step > c.
10:	id.	23:	id.
12:	id.	24:	id.
14:	id.	27:	= c.
22:	id.	Oct. 11:	1 step < d.
May 5:	id.	Nov. 10:	= f.
July 26:	< a. or > b.	13:	< g.
Aug. 19:	= b.	Dec. 4:	invisible.
24:	id.	9:	id.
27:	< a. or > b.	23:	id.

W *Pegasi.*[2]

Jan. 1:	W 1 step > e.	Oct. 11:	1 step < g.
2:	id.	Nov. 10:	= g.
19:	1 step > c.	13:	= f.
July 26:	invisible.	Dec. 4:	1 step > e.
Aug. 19:	< n*.	9:	1 step < d.
24:	id.	10:	= d.
Sept. 19:	< h.	23:	2 steps > c.

* n is a star between W and b.

SS *Cygni.*[3]

	P.M.		P.M.
Jan. 2,	6^h: SS < g.	Aug. 24,	10^h: = e.
20,	6^h: 1 step < g.	27,	10^h: = c.
Apr. 7,	14^h: < d.	31,	10^h: > c. or < b.
14,	9^h: < f.	Sept. 5,	10^h: = c.
22,	9^h: < d.	Sept. 8,	10^h: = d.
July 26,	11^h: = e.	11,	10^h: 1 step > e.
28,	10^h: < e. or > f.	12,	9^h: id.
Aug. 19,	10^h: = g*.	19,	9^h: < g.

* g is the faint companion-star next c towards East.

[1] Vide the sketch in the *Publications A. S. P.*, No. 22, p. 63.
[2] Vide the sketch in the *Publications A. S. P.*, No. 60, p. 23.
[3] Vide the sketch in the *Publications A. S. P.*, No. 100, p. 18.

Sept.	21, 9^h:	id.	Dec.	4, 6^h:	1 step < c.
	24, 9^h:	= h.		6, 6^h:	= d.
Oct.	11, 9^h:	= g.		9, 11^h:	= e.
Nov.	10, 6^h:	id.		11, 6^h:	id.
	13, 6^h:	id.		23, 6^h:	= g.

Y *Tauri* (B. D. + 20°.1083).

As comparison-stars I have used A = B. D. 20°.1095 ($7^m.4$) and b = B. D. + 20°.1073 ($8^m.2$). A third star, B = B. D. + 20°.1093 ($7^m.3$), I always find *smaller* than A.

Jan.	2:	> b.	Apr.	5:	id.
	19:	id.		12:	3 steps > A.
Mar.	2:	> A.	Sept.	27:	> A.
	14:	id.	Nov.	13:	= A.
	19:	= A.	Dec.	4:	a little > b.
	20:	> A.		9:	< A. and > b.
	29:	1 step > A.		23:	id.
Apr.	2:	id.			

This irregular variable star seems to have had its greatest brightness about the spring and summer of 1906, while in the year 1905 its brightness had not reached that of the star A.

TV *Cygni.*

This star oscillates in brightness a little about $9^m.5$. I have compared it with the stars b and c in the sketch by A. STANLEY WILLIAMS (*A. N.* 3629) and always found T V < b.

Apr.	7, 14^h:	TV = c.	Nov.	10, 6^h:	> c. and < b.
July	26, 11^h:	> c. and < b.		13, 6^h:	id.
Aug.	27, 10^h:	id.	Dec.	4, 6^h:	= c.
Sept.	25, 12^h:	id.		23, 6^h:	> c. and < b.
Oct.	11, 9^h:	id.			

FIREBALLS.

In the past year thirty-one fireballs have been seen from stations in Denmark. The details of the five most interesting of these meteors are here given, as follows:—

No. 1. April 11, 9^h 28^m P.M. An exploding meteor lightens up the whole region and disappears 30km above the mouth of Horsens Fjord. The path of the meteor went steeply downwards.—22 reports.

No. 2. June 24, 11^h 3^m. Gigantic fireball over northern Jutland, where a detonation like rumbling of thunder was heard. The meteor probably exploded above the island Laesö, in Kattegat, and the phenomenon was seen at several places

in Denmark, Norway, and Sweden. Some newspapers reported that fragments of this meteor had fallen down in the duckyard of the Göteborg, "Gibraltar," but unfortunately it was only a "newspaper duck"!—23 reports.

No. 3. July 26, $11^h\ 28^m$. An exploding fireball with a great flashing light was seen from Odder in the east, leaving a 5°-long train; duration 30^s.—7 reports.

No. 4. November 23, $2^h\ 45^m$. A large fireball was seen from several places in Jutland, in spite of the dazzling sunshine, as a sparkling exploding meteor, leaving an extensive train for a moment; 30km west from Horsens the meteor passed the zenith and over this region a loud detonation like thunder-roaring was heard. Some thought of a powder explosion; people ran out of the houses, thinking an earthquake had taken place; horses ran frightened about in the fields. The fireball exploded 60km above the ground, and, according to its direction, this meteor may be noted as a "salutation from the Bielids," which were expected at that time.—12 reports.

No. 5. December 18, $6^h\ 10^m$. A flashing and exploding fireball was seen from Jutland in the southeast, not far from *Saturn*, as observed at Odder. Its train was straight for a minute, but in the next minute it was turning and winding. —10 reports.

Shooting-Stars.

In the period August 9th-12th corresponding observations were arranged for from seven stations in Denmark. The weather was not favorable, and our efforts succeeded only on August 12th. At these stations 122 paths of shooting-stars were mapped, but only six proved suitable for calculation. These six meteors have given the following results:—

For Observation.

No.	Time.	Station.	Beginning.	Ending.	Mag.	Observer.
1	Aug. 12, $10^h\ 14^m\ 0^s$ P.M.	Odder	.....	316°.4 + 9°	2	T. Köhl.
		Nyborg	.....	310 + 15	2	Ch. Frost.
2	Aug. 12, 10 21 45 P.M.	Odder	359° + 22°.8	353 + 13	4	T. Köhl.
		Nyborg	20 + 44	6 + 30.3	2	Ch. Frost.
3	Aug. 12, 10 27 33 P.M.	Odder	.....	292 + 30	2	T. Köhl.
		Nyborg	.....	255.5 + 57	2	Ch. Frost.
4	Aug. 12, 10 36 30 P.M.	Odder	40 + 40.8	40 + 33	1	T. Köhl.
		Nyborg	56.5 + 47	59 + 41.2	2	Ch. Frost.
5	Aug. 12, 10 56 30 P.M.	Askov	50.8 + 37.2	54.2 + 31.7	♀	L. Dolleris.
		Odder	47 + 40.5	50 + 35	♀	T. Köhl.
		Nyborg	61.8 + 46	71 + 42.6	♀	Ch. Frost.
6	Aug. 12, 11 4 40 P.M.	Odder	.....	351 + 23	1	T. Köhl.
		Nyborg	.....	15 + 61.3	1	Ch. Frost.

For Calculation.

No.	Beginning. h	Beginning. λ	Beginning. φ	Ending. h	Ending. λ	Ending. φ	Real Length of the Path. β	Radiant. AR	Radiant. Decl.
1	....	.....	.....	51.9	1° 26.'6 w	54° 56'.4	....	.....	
2	95.1	0° 1'.4 e	55° 50'.1	102.4	0 32.0 e	55 26.4	55.6	153°	+22°.1
3	....	.....	.....	119.0	2 26.4 w	55 27.1	....	.....	
4	152.5	1 36.6 e	57 29.2	92.6	1 5.4 e	57 5.1	82.4	40 .2	+66 .6
5 AO	166.0	2 6.0 e	57 43.9	82.2	0 39.0 e	57 8.7	139.0	40 .3	+49 .9
5 AN	164.5	2 4.3 e	57 43.6	82.3	0 41.5 e	57 10.2	133.0	39 .5	+50 .3
5 ON	163.0	2 2.0 e	57 42.5	82.2	0 39.7 e	57 9.1	132.8	39 .8	+50 .3
6	....	.....	.....	83.1	1 3.2 w	55 39.3	....	.....	

h and β are expressed in kilometers; λ is longitude from Copenhagen; φ is north latitude; *h* is the altitude of the meteor above the Earth's surface.

ERRATA.

In the *Publications A. S. P.*, No. 89, p. 66, for *T U* read *R T* in the sketch as also in the text.

PLANETARY PHENOMENA FOR MARCH AND APRIL, 1907.

BY MALCOLM MCNEILL.

PHASES OF THE MOON, PACIFIC TIME.

Last Quarter..	Mar.	7,	12h 42m	A.M.	Last Quarter..	Apr.	5, 7h 20m A.M.
New Moon...	"	13,	10 5	P.M.	New Moon...	"	12, 11 6 A.M.
First Quarter.	"	21,	5 10	P.M.	First Quarter.	"	20, 12 38 P.M.
Full Moon...	"	29,	11 44	A.M.	Full Moon....	"	27, 10 5 P.M.

The Sun passes the vernal equinox and spring begins about 10 A.M., Pacific time, March 21st.

Mercury is an evening star at the beginning of March, setting about an hour and one half after sunset, and will be